

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A trans-reflective liquid crystal display device comprising:
 - a plurality of data and gate lines defining a plurality of pixels, the pixels having a reflection region and a transmission region;
 - a timing controller that receives, converts, and outputs image data;
 - a switching unit that determines the output signal of the timing controller according to a transmission mode or reflection mode;
 - a gate driver that receives a gate signal from the timing controller;
 - a data driver that receives a data signal from the timing controller;
 - a liquid crystal display panel with a TFT array substrate, and a color filter substrate and a liquid crystal layer interposed therebetween, wherein the liquid crystal display panel includes: a TFT formed on the TFT array substrate; an organic layer formed on the TFT array substrate including the TFT; a transmission hole formed in the organic layer and having a slanted side profile; a reflection electrode formed on an upper surface of the organic layer including the slanted side of the transmission hole; a passivation layer formed on the reflection electrode and the transmission hole; a pixel electrode formed on the passivation layer and connected to the TFT; a black matrix formed on the color filter substrate; and color filter layers formed on portions of the color filter substrate corresponding to the reflection region, wherein the liquid crystal display panel displaying image data according to a gate pulse and a data voltage applied by the gate driver and the data driver;
 - a sequential backlight including red, green, and blue lamps wherein, the backlight is turned on in a transmission mode to sequentially transmit light into the transmission region and is turned off in a reflection mode, wherein the backlight is disposed under the TFT array substrate; and
 - a backlight controller connected to the sequential backlight to control the timing of light emissions in the transmission mode.

2. (Original) The trans-reflective liquid crystal display device of claim 1, wherein the color filter substrate includes a color filter formed in the reflection region.

3. (Cancelled)

4. (Original) The trans-reflective liquid crystal display device of claim 1, wherein the data driver includes a MUX circuit shorting three adjacent data lines, the MUX circuit being turned on in the transmission mode and turned off in the reflection mode.

5. (Original) The trans-reflective liquid crystal display device of claim 1, wherein the backlight includes a light emitting diode.

6. (Previously Presented) The trans-reflective liquid crystal display device of claim 1, wherein the cell gap in the transmission region is twice that in the reflection region.

7. (Original) The trans-reflective liquid crystal display device of claim 1, wherein the timing controller divides one frame of display data into three sub-frames.

8. (Currently Amended) A method of driving a trans-reflective liquid crystal display device having a plurality of pixels defined by a plurality of data and gate lines arranged in the transverse and longitudinal directions, the pixels having a transmission region and a reflection region, the method comprising the steps of:

supplying image data to a timing controller;

selecting a transmission mode or a reflection mode by a switching unit;

converting and outputting the image data by the timing controller;

forming a liquid crystal display panel with a TFT array substrate, and a color filter substrate and a liquid crystal layer interposed therebetween,

wherein the forming the liquid crystal display panel includes: forming a TFT on the TFT array substrate; forming an organic layer on the TFT array substrate including the TFT; forming a transmission hole in the organic layer and having a slanted side profile; forming a reflection electrode on an upper surface of the organic layer including the slanted side profile of the transmission hole; forming a passivation layer on the reflection electrode and the transmission hole; forming a pixel electrode on the passivation layer and connected to the TFT; forming a black matrix on the color filter substrate; and forming color filter layers on portions of the color filter substrate corresponding to the reflection region;

disposing a backlight having red, green, and blue lights under the trans-reflective liquid crystal display device;

transmitting external light through a color layer to display a color image in the reflection mode and operating the backlight having red, green, and blue lights to display the color image in the transmission mode, the backlight sequentially emitting light having red, green, and blue colors in the transmission region of the pixel;

dividing one frame into three sub-frames to transmit sequentially light having red, green, and blue colors in the transmission mode; and

applying the same data voltage to the adjacent three pixels every sub frame in the transmission mode.

9. (Cancelled)

10. (Original) The method of claim 8, further comprising applying independent data voltages to each pixel in the reflection mode.

11. (Currently Amended) A liquid crystal display device, comprising:

a liquid crystal panel having a plurality of pixels defined by a plurality of gate and data lines arranged on a first substrate, the pixels having a reflection region and a transmission region; a switching device in each pixel;
an organic layer formed on the first substrate including the switching device;

a transmission hole formed in the organic layer and having a slanted side profile;

a reflective electrode in the reflection region to reflect light incident from outside the liquid crystal panel, wherein the reflection electrode formed on an upper surface of the organic layer including the slanted side of the transmission hole;

a passivation layer formed on the reflection electrode and the transmission hole;

a pixel electrode formed on the passivation layer and connected to the switching device;

a black matrix formed on the second substrate;

color filter layers formed on portions of the second substrate corresponding to the reflection region;

a liquid crystal layer between the first substrate and the second substrate;

a backlight including red, green, and blue light emitting diodes, the light emitting diodes sequentially emitting light in the transmission region, wherein the backlight is disposed under the TFT array substrate;

a color layer in the reflection region;

a timing controller that receives, converts, and outputs image data;

a switching unit that determines the output signal of the timing controller according to a transmission mode or a reflection mode; and

a backlight controller that controls the backlight based upon the output of the timing controller.

12. (Cancelled)

13. (Original) The liquid crystal display device of claim 11, wherein the liquid crystal panel includes:

a second substrate; and

a liquid crystal layer between the first and second substrate.

14. (Original) The liquid crystal display device of claim 11, wherein the switching device includes a thin film transistor.

15. (Original) The liquid crystal display device of claim 11, wherein the cellgap between the substrates in the transmission region is twice the cell gap in the reflection region.

16-18 (Cancelled)

19. (Previously Presented) The liquid crystal display device of claim 11, further comprising a gate driver connected to the gate lines and a data driver connected to the data lines.

20. (Previously Presented) The liquid crystal display device of claim 11, further comprising a MUX circuit shorting out three adjacent data lines, wherein the MUX circuit is turned on in a transmission mode and turned off in a reflection mode.

21. (Previously Presented) The trans-reflective liquid crystal display of claim 11, wherein the light from the backlight passes through the color filter substrate unfiltered.

22. (Previously Presented) The method of claim 8, wherein the light from the backlight does not pass through a color layer.

23. (Previously Presented) The liquid crystal display device of claim 11, wherein color layer is only in the reflective region.

24. (Currently Amended) A trans-reflective liquid crystal display device comprising:
a plurality of data and gate lines defining a plurality of pixels, the pixels having a reflection region and a transmission region;

a timing controller that receives, converts, and outputs image data, wherein the timing controller divides one frame of display data into three sub-frames;

a switching unit that determines the output signal of the timing controller according to a transmission mode or reflection mode;

a gate driver that receives a gate signal from the timing controller;

a data driver that receives a data signal from the timing controller, wherein the data driver includes a MUX circuit shorting three adjacent data lines, the MUX circuit being turned on in the transmission mode and turned off in the reflection mode;

a liquid crystal display panel with a TFT array substrate, and a color filter substrate and a liquid crystal layer interposed therebetween, wherein the liquid crystal display panel includes: a TFT formed on the TFT array substrate; an organic layer formed on the TFT array substrate including

the TFT; a transmission hole formed in the organic layer and having a slanted side profile; a reflection electrode formed on an upper surface of the organic layer including the slanted side of the transmission hole; a passivation layer formed on the reflection electrode and the transmission hole; a pixel electrode formed on the passivation layer and connected to the TFT; a black matrix formed on the color filter substrate; and color filter layers formed on portions of the color filter substrate corresponding to the reflection region, wherein the liquid crystal display panel displaying image data according to a gate pulse and a data voltage applied by the gate driver and the data driver; , wherein the color filter substrate includes a color filter formed in the reflection region, wherein the data driver includes a MUX circuit shorting three adjacent data lines, the MUX circuit being turned on in the transmission mode and turned off in the reflection mode;

a sequential backlight including red, green, and blue lamps wherein, the backlight is turned on in a transmission mode to sequentially transmit light into the transmission region and is turned off in a reflection mode, wherein the backlight is disposed under the TFT array substrate and includes a light emitting diode; and

a backlight controller connected to the sequential backlight to control the timing of light emissions in the transmission mode.

25. (Currently Amended) A liquid crystal display device, comprising:

a liquid crystal panel having a plurality of pixels defined by a plurality of gate and data lines arranged on a first substrate, the pixels having a reflection region and a transmission region, wherein the liquid crystal panel includes: a second substrate; and a liquid crystal layer between the first and second substrate, wherein the cell gap between the substrates in the transmission region is twice the cell gap in the reflection region;

a switching device in each pixel, wherein the switching device includes a thin film transistor;

an organic layer formed on the first substrate including the switching device;

a transmission hole formed in the organic layer and having a slanted side profile;

a reflective electrode in the reflection region to reflect light incident from outside the liquid crystal panel, wherein the reflection electrode formed on an upper surface of the organic layer including the slanted side of the transmission hole;

a passivation layer formed on the reflection electrode and the transmission hole;

a pixel electrode formed on the passivation layer and connected to the switching device;

a black matrix formed on the second substrate;

color filter layers formed on portions of the second substrate corresponding to the reflection region;

a liquid crystal layer between the first substrate and the second substrate;

a backlight including red, green, and blue light emitting diodes, the light emitting diodes sequentially emitting light in the transmission region, wherein the backlight is disposed under the TFT array substrate;

a color layer in the reflection region;

a timing controller that receives, converts, and outputs image data;

a switching unit that determines the output signal of the timing controller according to a transmission mode or a reflection mode; and

a backlight controller that controls the backlight based upon the output of the timing controller.